DOCUMENT RESUME

ED 348 016 IR 015 753

AUTHOR Pridemore, Doris R.; Klein, James D.
TITLE Effects of Learner Control over Feedback in Computer-Based Instruction.
PUB DATE Feb 92
NOTE 10p.; In: Proceedings of Selected Research and Development Presentations at the Convention of the Association for Educational Communications and Technology and Sponsored by the Research and Theory Division; see IR 015 706.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Attitude Measures; Comparative Analysis; *Computer Assisted Instruction; *Feedback; Higher Education; Instructional Design; *Instructional Effectiveness; Intermode Differences; *Learner Controlled Instruction; Pretests Posttests; *Student Attitudes; Time on Task; Undergraduate Students
IDENTIFIERS Elaboration Theory; Verification

ABSTRACT

Although both learner control and feedback have been heavily researched, very little research has been conducted on giving learners control over the feedback which they receive. The purpose of this study was to examine the effect of learner control of feedback in a computer assisted instruction (CAI) lesson. The independent variables were type of control (learner or program) and level of feedback (verification or elaboration), The dependent variables were performance on a posttest, attitude toward the program, and time to study feedback. The subjects, who were 100 undergraduate education majors enrolled in an educational psychology class at a large southwestern university, used one of four CAI programs which provided either program control or learner control over verification or elaboration feedback. Results indicated that subjects who received elaboration feedback during instruction performed better than students who received verification feedback. Type of control did not have a significant influence on performance. Implications of these findings for the design of CAI are discussed. (17 references) (Author/BBM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED348016

Title:

Effects of Learner Control Over Feedback in Computer-Based Instruction

Authors:

Doris R. Pridemore
James D. Klein

IR015253

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Michael Simonson

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

Effects of Learner Control over Feedback in Computer-based Instruction

Doris R. Pridemore
and
James D. Klein

Learning & Instructional Technology
Arizona State University

Abstract

Although both learner control and feedback have been heavily researched, very little research has been conducted on giving learners control over the feedback which they receive. The purpose of this study was to examine the effect of learner control over feedback in a CAI lesson. Subjects used one of four CAI programs which provided either program control or learner control over verification or elaboration feedback. Results indicated that subjects who received elaboration feedback during instruction performed better than students who received verification feedback. Type of control did not have a significant influence on performance. Implications for the design of CAI are discussed.

Introduction

While a great deal of research has been conducted on learner control and on feedback, few studies have been conducted to determine if learner control of feedback will have an effect on student performance and attitude. Computers now make it possible to allow learners to control the amount of feedback in instruction. But it is not clear whether giving learners control of feedback is beneficial. Some writers have suggested that the "mere illusion of control" significantly improves motivation and performance (Perlmuter and Monty, 1977), while others have concluded "there is little support from the research literature that offering students control will lead to increased learning" (Carrier, 1984, p. 17).

Several researchers report advantages for allowing learners to have control in computer-assisted instruction. Learner control over the instructional strategy of a CAI program has positively influenced retention of information and student interest (Newkirk, 1973). Learner control over review options (Kinzie, Sullivan, & Berdel, 1989) and contextual properties (Ross & Morrison, 1989) in CAI lessons has

significantly increased test performance. Hansen (1974) found that learner control over feedback in a CAI lesson decreased student anxiety about learning, while others have reported that both feedback and learner control in CAI increased student performance and attitude (Schloss, Wisniewski, & Cartwright, 1988; Steinberg, Baskin, & Hofer, 1986).

According to Clariana, Ross, and Morrison (1991) feedback is an important variable that is often ignored in CAI. Researchers have reported that feedback increases learner performance and reduces program errors (Anderson, Kulhavy & Andre, 1972; Kulhavy, 1977; Kulhavy, Yekovich, & Dyer, 1979).

Feedback is a unit of information with two components, verification and elaboration (Kulhavy & Stock, 1989). Verification is the simple dichotomous judgment that an initial response was right or wrong. Elaboration consists of all substantive information contained in the feedback message. Collins, Carnine & Gersten (1987) demonstrated that when verification and elaboration were given in CAI, performance was significantly higher for elaboration, while the time to complete was similar. In addition, a meta-analysis conducted by Bangert-Drowns, Kulik, Kulik, and Morgan (1991) indicated that elaboration feedback produced greater effects for learning than verification feedback.

The purpose of this study was to examine the effect of learner control over feedback in computer-assisted instruction. The independent variables were type of control (learner or program) and level of feedback (verification or elaboration). The dependent variables were performance on a posttest, attitude toward the program, and time to study feedback.

Method

Subjects

Subjects were 100 undergraduate education majors enrolled in an educational psychology class at a large southwestern university. Data for 93 out of the original 100 subjects were included in the analyses of the results because scores on one or more measures were unavailable for the remaining seven subjects.

Materials

Materials used in this study were four CAI lessons, a posttest, and an attitude questionnaire. The CAI lessons were developed using a software package called the Presenter (Behrens & Stock, 1990). All lessons provided the same

information, examples, and practice on the concepts of reliability and validity. The lessons were based on the text Topics in Measurement: Reliability and Validity by Dick & Hagerty (1971). Information and examples were presented in sections of five screens of text, followed by eight, five-alternative, multiple-choice questions. This cycle continued for a total of 25 screens of text and 40 questions.

The differences in the CAI lessons were based on type of control (program and learner) and level of feedback (verification and elaboration). Under program control, the computer program administered one of the two feedback conditions automatically. Under learner control, subjects decided if they wanted to receive feedback. Under the condition of verification, a learner was told only if a response was correct or incorrect; while under elaboration, a learner was told if a response was correct or not, the correct answer, and a short explanation.

Subjects using the program control/verification lesson were always provided with the feedback message "yes, you are correct" or "no, you are incorrect" after each practice question. Subjects using the learner control/verification lesson were asked "would you like to check your answer?" after each question. If the response was, "yes", then the appropriate verification feedback was presented. If the response was, "no", the program continued with the next question or screen of text.

Subjects using the program control/elaboration lesson always received verification information, followed by the correct answer and a short explanation after each practice question. Subjects using the learner control/elaboration lesson were asked "would you like to check your answer?" after each question. If the response was, "yes", verification appeared as described above. The lesson then asked, "would you like an explanation?" If the response was, "yes", the correct answer and an explanation appeared before the program continued. If the response was "no", the lesson continued with the next question or screen of text.

In addition to the four CAI lessons, a posttest and an attitude questionnaire were developed. The posttest consisted of the same 40 questions previously given as practice but presented in a random order. The reliability of the posttest was calculated at .69 using the Kuder-Richardson 20 formula. The attitude questionnaire consisted of ten items measuring student satisfaction, enjoyment, perception of control, and feeling toward feedback. The questionnaire used a five point Likert-type scale. Both measures were administered on the

computer. In addition, the computer automatically recorded the number of seconds each subject spent studying feedback messages.

Procedure

Before subjects arrived to participate in the study, an experimenter prepared the computer laboratory by installing one of the four lessons into each computer. Upon arrival to the computer room, each subject was randomly assigned to one of the four experimental conditions. All four of the conditions were present at each experimental session.

The experimenter gave a short introduction on general procedures and told subjects that instructions were included in the program. They were not told that the programs were different. Subjects were told that the lesson was on reliability and validity and stressed the importance of the material for them as future teachers. Subjects were also told that they would have to pass a test at the end of the lesson in order to receive points toward their final course grade. Subjects then proceeded with their individual lessons. Upon completion of the lesson, each subject completed the attitude questionnaire and the posttest on the computer. They were given as much time as they needed to complete the lessons and the criterion measures. Most subjects completed the study within a 50-minute class period.

Design and Data Analysis

The design was a 2 x 2 factorial with type of control (learner or program) and level of feedback (verification or elaboration) as the independent variables. The dependent variables were performance, attitude, and feedback study time.

Analysis of variance (ANOVA) was used to test for differences between groups on performance and feedback study time. A multiple analysis of variance (MANOVA) was used to test for differences between groups on the attitude questionnaire. The MANOVA was followed by univariate analysis for each question. An alpha level of .05 was set for all statistical tests. In addition, effect sizes (ES) were calculated.

Results

Performance

Mean scores and standard deviations for performance can be found in Table 1. These data indicate that the mean for

subjects who received verification feedback was 25.11, while the mean for subjects who received elaboration feedback was 31.15. The mean score for the program control group was 28.59 and the mean score for the learner control group was 27.67.

Analysis of the posttest data indicated that level of feedback had a significant effect on performance $F(1, 89) = 39.47$, $p < .05$, $MSe = 21.41$, ES = 1.09. Subjects who received elaboration feedback performed better than those receiving verification feedback, regardless of the type of control provided. The difference for type of control and the feedback by control interaction were not significant.

Table 1
Means and Standard Deviations for Performance

		Type of Feedback		
Control		Verification	Elaboration	Totals
Program	M	25.17	32.00	28.59
	SD	4.72	3.66	4.19
Learner	M	25.04	30.29	27.67
	SD	4.79	5.18	4.98
Totals	M	25.11	31.15	28.15
	SD	4.76	4.42	4.63

Highest possible score was 40. Cell sizes were 24 for learner Control/elaboration and 23 for the other three conditions.

Attitude

Analysis of the 10-item attitude questionnaire data revealed a significant MANOVA effect for level of feedback, $F(10, 80) = 4.93$, $p < .05$. Follow-up univariate analyses indicated a significant difference between feedback conditions for item 10 (I would have liked to have more feedback about my answers), $F(1, 89) = 39.48$, $p < .05$, $MSe = 1.04$, ES = .55. Subjects who received verification ($M = 1.35$, $SD = 0.71$) indicated a greater desire to receive more feedback than those who received elaboration ($M = 2.66$, $SD = 1.22$). No other significant differences were found on the attitude questionnaire.

Feedback Study Time

The means and standard deviations for feedback study time were calculated in seconds. The largest differences in feedback study time were between subjects who received verification ($M = 70.96$, $SD = 20.56$) and those who received elaboration ($M = 287.67$, $SD = 124.61$). The mean for subjects

who received program control was 165.07 (SD = 152.35) and the mean for those who received learner control was 195.76 (SD = 130.23).

Analysis of the data for feedback study time revealed a significant effect for level of feedback, F(1, 89) = 132.60, p <. 05, MSe = 8225.63, ES = .75. Subjects who received elaboration spent an average of 217 seconds more when studying feedback than subjects who received verification. Type of control did not significantly affect feedback study time.

Discussion

The purpose of this study was to investigate the effects of learner control over feedback in an instructional computer program. Results suggest that students who receive elaboration feedback during instruction will perform better than students who receive verification feedback. This is consistent with other research which indicates that elaboration, rather than verification, produces greater effects in learning (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Collins, Carnine & Gersten, 1987).

There are several possible reasons why elaboration affected performance in the current study. One likely reason is that performance was improved due to the increased amount of information in the elaborated feedback message. Students who received elaboration were provided with the correct answer and an explanation of that answer after each practice question. However, subjects in the verification condition were only told whether their answers were correct or incorrect. It is likely that students who received elaboration used this additional information to correct errors made on practice items.

Another factor that may have contributed to the positive effect for elaboration is the increased in time spent in studying feedback. Students who received elaboration spent more time studying feedback than those who received verification. Additionally, students who received verification indicated a desire to have more feedback during instruction.

The results of this study suggest some implications for the design of CAI. Instructional designers should consider providing different feedback messages in CAI lessons depending on student responses. Verification feedback could be provided to students when their initial response to an item is correct, but it seems vital to provide elaborated feedback when an initial response if incorrect. CAI has the capability to

provide differing feedback messages depending upon student responses.

The current study also has some implications for future research on feedback and learner control. Future studies should investigate whether different feedback messages will increase performance when the feedback is based on student responses. Research on the effect of verification and elaboration feedback should be conducted on differing learning outcomes. Furthermore, future research should examine if learner control based on student responses during practice will affect performance. Implementation of these suggestions will assist us in determining the conditions under which different types of feedback and learner control provide the greatest benefits.

References

Anderson, R. C., Kulhavy, R. W., & Andre, T. (1972). Conditions under which feedback facilitates learning from programmed lessons. Journal of Educational Psychology, 63, 186-188.

Bangert-Drowns, R. L., Kulik, C. C., Kulik, J. A., & Morgan M. (1991). The instructional effect of feedback in test-like events. Review of Educational Research, 61, 2, 213-238.

Behrens, J. T., & Stock, W. A. (1990). PRESENTER: Microcomputer programs for text-based experiments. Technical Report ZN-16, Instructional Science Research Facility, Arizona State University, Tempe, AZ 85287-0611.

Carrier, C. (1984). Do learners make good choices? Instructional Innovator, 29(2), 15-17, 48.

Clariana, R. B., Ross, S. M. & Morrison, G. R. (1991). The effects of different feedback strategies using computer-administered multiple-choice questions as instruction. Educational Technology Research & Development, 39, 5-17.

Collins, M. Carnine, D., & Gersten, R. (1987). Elaborated corrective feedback and the acquisition of reasoning skills: A study of computer-assisted instruction. Exceptional Children, 54, 254-262.

Dick, W., & Hagerty, N. (1971). Topics in measurement: Reliability and validity. New York: McGraw-Hill Book Company.

Hansen, J. B. (1974). Effects of feedback, learner control, and cognitive abilities on state anxiety and performance in a CAI task. Journal of Educational Psychology, 66, 247-254.

Kinzie, M. B., Sullivan, H. J., & Berdel, R. L. (1988). Learner control and achievement in science computer-assisted instruction. Journal of Educational Psychology, 80, 299-303.

Kulhavy, R. W. (1977). Feedback in written instruction. Review of Educational Research, 47, 211-232.

Kulhavy, R. W., & Stock, W. A. (1989). Feedback in written instruction: The place of response certitude. Educational Psychology Review, 1, 279-308.

Kulhavy, R. W., Yekovich, F. R., & Dyer, J. W. (1979). Feedback and content review in programmed instruction. Contemporary Educational Psychology, 4, 91-98.

Newkirk, R. L. (1973). A comparison of learner control and machine control strategies for computer-assisted instruction. Programmed Learning and Educational Technology, 10, 82-91.

Perlmuter, L. C., & Monty, R. A. (1977). The importance of perceived control: Fact or fantasy? American Scientist, 65, 759-765.

Ross, S. M., & Morrison, G. R. (1989). In search of a happy medium in instructional technology research: Issues concerning external validity, media replications, and learner control. Educational Technology, Research & Development, 37(1), 19-33.

Schloss, P. J., Wisniewski, L. A., & Cartwright, G. P. (1988). The differential effect of learner control and feedback in college student's performance on CAI modules. Journal of Educational Computing Research, 4, 141-150.

Steinberg, E. R., Baskin, A. B., & Hofer, E. (1986). Organizational/memory tools: A technique for improving problem solving skills. Journal of Educational Computing Research, 2, 169-187.